Space Weather Forecast

Issued on Friday, 09 February 2024 at 12:36 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate Radio Blackouts Likely. Slight Chance Minor Geomagnetic Storm to start and end period. Ongoing daily Slight Chance of Minor Solar Radiation Storm.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the past 24 hours, with several Moderate-class flares observed, the peak of which was a long-period event at 08/2355UTC from a departing large sunspot region which now lies narrowly over the western solar horizon. There are now seven surviving sunspot regions on the facing side.

One active region is now utterly dominant in terms of area and magnetic complexity, currently lying near the middle of the Sun with its span up to 18 degrees. There was some consolidation evident in recent hours in its peripheral small spots, leading to a slight reduction in overall area. Thus far this region has produced a mixture of impulsive and long-period X-ray flare characteristics.

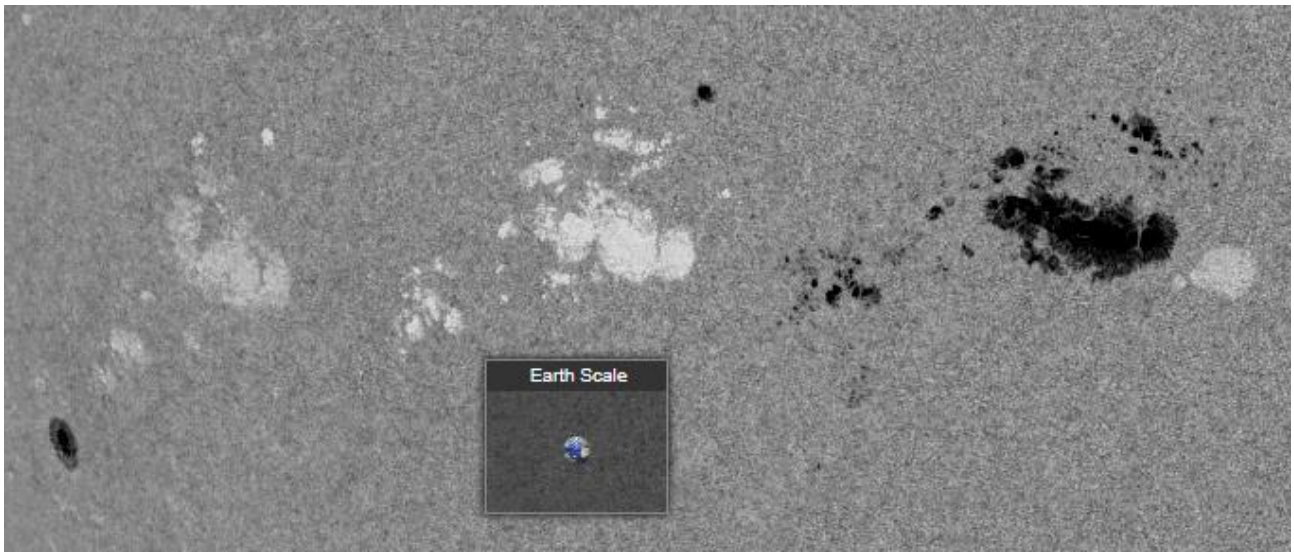

Figure 1: Helioviewer.org-derived diffrence imagery of the footprint of the large and magnetically complex sunspot nearing the middle of the Sun at 06/1200UTC (faint white, left), (white, centre) 08/0000UTC and (black, right) 09/1200UTC (i.e. at 36-hour intervals). Earth is shown inset for scale.

There were 'filament eruptions' (arcs of plasma leaving the Sun) observed in the period - firstly one from south-centre at 08/2030UTC. This appeared to remain anchored longest at its eastern end to perhaps deflect it more eastward than would be expected from its location on the facing side. This event has been tentatively associated with a Coronal Mass Ejection (CME) seen heading in part slightly east of the Sun-Earth line, but overlapping an earlier CME from behind the eastern solar

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horizon on imagery to complicate analysis. Confidence in this attribution is therefore low overall, however MOSWOC modelling suggests this CME crosses the radius of Earth's orbit around 12/1200UTC.

A second possible 'filament eruption' occurred in the northeast of the Sun at 08/2300UTC, however there was no definitive ejecta seen. Other CME-generated events were largely associated with the off-going southwestern regions, with no Earth effects anticipated, although modelling is still being carried out to confirm this.

Solar Wind / Geomagnetic Activity: Solar winds were slightly elevated, with speeds on a roughly level trend. This is possibly the tail end of a coronal hole fast wind, although the feature itself is now no longer visible over the western solar horizon. This mainly stable tendency applied to most solar wind characteristics, with the number of particles in the solar wind and their associated magnetic field both within background levels.

The net result of the above solar wind measures was provisionally quiet geomagnetic activity throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate X-ray flare activity remains likely, and Strong-class activity a slight chance, with a slight reduction in the daily risks of both with the passing of one large sunspot before the UTC weekend. The contributions from a suite of arriving eastern regions has yet to be determined, pending their presentation for analysis.

Solar Wind / Geomagnetic Activity: Up to two glancing incidence CMEs may feature in the period: firstly from 06 February which may bring a Slight Chance of Minor Geomagnetic Storm G1 inside the coming 24 hours, and then a second event from the 08/2030UTC 'filament eruption', that may round out the forecast period with a slight chance of G1 later in the UTC day of Monday 12 February. No fast wind regimes are otherwise expected, and the forecast may be quiet throughout should both CMEs not affect Earth.

Energetic Particles / Solar Radiation: Solar radiation levels have the potential to rise in response to any significant X-ray flares, most likely from the departing large sunspot or, increasingly, the one nearing the middle of the facing side. Because the component from the first reduces as the latter increases, the risk is a roughly stable slight chance of S1 Minor Solar Radiation Storm on all days of the period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	1	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	60	60	60
Very Active	R3 to R5 X	No	20	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	20	20	20	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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